OUT-67141

TOP SECRET

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CORONA

REF A. [redacted]

B.

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SUBJECT: MISSION 1106, PHOTOGRAPHIC EVALUATION INTERIM REPORT (PEIR)

1. NUMERICAL SUMMARY:

MSN NO AND DATES: 1106-1, 5 - 9 FEBRUARY 1969
1106-2, 9 - 14 FEBRUARY 1969

LAUNCH DATE AND TIME: 5 FEBRUARY 1969/2159Z

VEHICLE NUMBER: 1650

CAMERA SYSTEM: CR-6

PAN CAMERA NO: FORWARD LOOKING, 313 - FILM TYPE: 3404
AFT LOOKING, 312 - FILM TYPE: 3404/SO-121 (2402)

DISIC CAMERA NO: 6

STELLAR LENS NOS: 11P, 6, FILM TYPE: 3401

TERRAIN LENS NO: 105 (F/4.5), FILM TYPE: 3400

RECOVERY REVS: MSN 1106-1, REV 66
MSN 1106-2, REV 147

2. CAMERA SETTINGS:

FWD LOOKING WRATTEN 23A FILTER (PRIMARY)
WRATTEN 25 FILTER (ALTERNATE)
WRATTEN 25 FILTER (ALTERNATE)
SLIT WIDTHS: 0.173, 0.197, 0.249, 013.. AND A FAIL SAFE SLIT OF 0.252 INCH

AFT LOOKING WRATTEN 21 FILTER (PRIMARY)
2E PLUS 20C PLUS 0.50 ND FILTER (ALTERNATE)
SLIT WIDTHS: 0.144, 0.154, 0.187, 0234 AND A FAIL SAFE SLIT OF 0.197 INCH

3. PERFORMANCE SUMMARY

THE BEST IMAGERY OF MISSION 1106 CLOSELY APPROACHES THAT OF THE BEST OBTAINED FROM THE CORONA SERIES. HOWEVER THE QUALITY DOES VARY FROM GOOD TO FAIR WITH THE FWD BEING RATED BETTER. THE PRIME CAUSE OF THIS VAIRATION IS ATTRIBUTED TO ATMOSPHERIC CONDITIONS CHANGING FROM FAVORABLE TO UNFAVORABLE. A HIGH PERCENTAGE OF CLOUD FREE PHOTOGRAPHY (80PERCENT) HAS BEEN REPORTED FOR THE MISSION WHICH SUGGESTS GOOD VISIBILITY, WHEREAS EVALUATION OF THE MAIN AND INDEX CAMERA FRAMES INDICATES MANY FRAMES WERE DEGRADED BY HAZE. THE COLOR FILM (SO-121) USED IN THE LATER PORTION OF THE FLIGHT HAS EXAMPLES OF CLEAR AND HAZY AREAS ON THE SAME FRAME. FRAMES 93 AND 94 (AFT) OF D104 PROVIDE GOOD ILLUSTRATIONS OF HAZE EFFECT ON IMAGERY. THE PI SUITABILITY OF THE BLACK AND WHITE RECORD OF THIS MISSION IS RATED AS FAIR TO GOOD.

4. ANOMALIES

A. ANOMALY - THE IMAGERY ON PASSES D01 THROUGH D05 IS SEVERELY SMEARED ON BOTH FWD AND AFT CAMERAS IN THE 1106-1 MISSION DUE TO A V/H MISMATCH.

CAUSE - SLOPE PROGRAMMER ECCENTRICITY FUNCTION INOPERATIVE DUE TO MALFUNCTION OF NORMAL MODE OSCILLATOR. POTTED CONSTRUCTION OF OSCILLATOR PREVENTS DIRECT COMPONENT FAILURE ANALYSIS.

ACTION - ADDITIONAL CYCLIC TESTS AND INSPECTION OF CIRCUITRY WIRING TO BE CONDUCTED ON SLOPE PROGRAMMER DURING AND AFTER ENVIRONMENTAL PHASES OF CR-7 AND UP.

B. ANOMALY - MINUS DENSITY SPOTS

MINUS DENSITY SPOTS WERE OBSERVED ON PASSES D001 AND D002 ON BOTH THE FORWARD AND AFT ORIGINAL NEGATIVES. THE MINUS DENSITY SPOTS VAIRED IN SIZE AND SHAPES. THEIR SIZE RANGED FROM MINUTE PIN HOLES TO SPOTS APPROXIMATELY 1/16 INCH IN DIAMETER. THE SPOTS WERE ESSENTIALLY LOCALIZED IN A SMALL

CY	
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2	CARD SEC.
	PROFILE
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3,4	TSS 14 FEB 69
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NUMBER OF FRAMES (6 FRAMES ON THE FWD AND 2 FRAMES ON THE AFT) ON BOTH MAIN RECORDS OCCURING A FEW FRAMES AFTER START OF REV D001.

CAUSE - THE SPOTS APPEAR ON A THREE AND ONE-EIGHTH REPEAT PATTERN, INDICATING A ONE INCH ROLLER TRANSFER OF A SUBSTANCE EFFECTING FILM SENSITIVITY OR DEVELOPABILITY.

ACTION - INVESTIGATION OF THIS CONTAMINATING SUBSTANCE AND SOURCE WILL BE UNDERTAKEN. (MONITOR [redacted] 25X1

C. ANOMALY - THE STARBOARD HORIZON SHUTTER ON THE FWD-LOOKING CAMERA FAILED TO CLOSE DURING FILM METERING ON PASSES D26, D39, D40 AND D48 OF 1106-1 AND D55 ON 1106-2. TWO FRAMES OF PHOTOGRAPHY ARE FOGGED FOR EACH OCCURRENCE OF THIS ANOMALY.

CAUSE - A MALFUNCTION OF THE A. O. CAMERA SHUTTER.

ACTION - THE SHUTTER RELIABILITY HAS BEEN EXTENSIVELY STUDIED. THE PROBABILITY OF A LONG TERM OPEN FAILURE IS CONTRARY TO THE FAILURE MODE, I.E. SHUTTER TO CLOSE ON NEXT A.O. SHUTTER COMMAND. A CORRELATION TO FLIGHT PROFILES WILL BE MADE. REFERENCE PEIR ACTION ITEMS 133/1041 AND 221/1104. (MONITOR - [redacted] 25X1

D. ANOMALY - THE SLP BLOCK ON THE AFT LOOKING INSTRUMENT (312) EXHIBITED A PLUS DENSITY BLEEDING BETWEEN BINARY BITS ON ALL DATA BLOCK IMAGES OF 1106-1 AND 1106-2.

CAUSE - THE MYLAR COATING ON THE FRONT SURFACE OF THE SLP DATA HEAD WAS WRINKLED. REFLECTIONS FROM THIS WRINKLED SURFACE PRINTED BWETEEN THE DATA BITS ON THE FILM. THIS ANOMALY CAUSED NO PROBLEMS WITH THE AUTOMATIC DATA READER, AS THERE IS SUFFICIENT SEPARATION BETWEEN ADJACENT DATA BITS.

ACTION - THIS CONDITION WAS OBSERVED DURING FLIGHT READINESS TESTING. MICRODENSITOMETRIC TRACES DEMONSTRATED ACCEPTABLE QUALITY. NO ADDITIONAL ACTION IS REQURED.

E. ANOMALY - SLIGHT VIGNETTING IS APPARENT ON THE STARBOARD A.O. FRAMES FROM BOTH INSTRUMENTS 312 AND 313 FOR 1106-1 AND 1106-2. THIS VIGNETTING IS VISIBLE ON FRAMES THAT DISPLAY LOW DENSITY IMAGERY.

CAUSE - THIS VIGNETTING WAS SO SLIGHT THAT THE CAUSE CANNOT BE ESTABLISHED.

ACTION - NO FURTHER ACTION IS REQUIRED.

F. ANOMALY - MINOR PLUS DENSITY ON ORIZON IMAGERY.

CAUSE - THE DESIGN CHANGE (CR-6 AND UP) OF THE HORIZON CAMERA PLATENS CAUSES SEVERAL DENSITY MARKS VERSUS THE SINGLE MARK SEEN ON PREVIOUS SYSTEMS.

ACTION - THE NEW PLATEN IS NOTCHED TO PERMIT CLEARANCE OF THE NEW FORMAT END ROLLERS. EACH POINT OF CONTACT CAUSES A MINOR DENSITY PRESSURE MARK. THIS WILL BE CHARACTERISTIC OF FUTURE SYSTEMS. NO ACTION IS RECOMMENDED.

G. ANOMALY - THE SWITCH PROGRAMMER BECAME INOPERATIVE BEGINNING WITH REV 22 OF 1106-1 AND REMAINED INOPERATIVE DURING THE BALANCE OF THE MISSION.

CAUSE - FAILURE ANALYSIS INDICATED THAT A RELAY FAILED TO RESPOND TO COMMAND.

ACTION - THE FAILURE IS 0.4 PER 1000 ON THIS COMPONENT. INSPECTION AND TESTING IN A NORMAL MANNER WILL CONTINUE PENDING REVIEWS OF PROGRAMMER DESIGN AND FAILURE REPORTS ON THIS COMPONENT. (MONITOR [redacted] 25X1

H. ANOMALY - THE SRV TAPE RECORDER FAILED TO OPERATE DURING 1106-2.

CAUSE - VENDOR ANALYSIS INDICATES A COMPONENT FAILURE IN

INVERTER MODULE.

ACTION - THE RECORDER WAS A REFURBISHED FLIGHT UNIT. FAILURE ANALYSIS IS BEING CONTINED TO DETERMINE THE SPECIFIC CAUSE OF COMPONENT FAILURE. PART REPLACEMENT IS ANTICIPATED. THE SWITCH PROGRAMMER PROBLEM WAS CIRCUMVENTED BY MANUAL REAL TIME CHANGING OF SLIT POSITIONS AS REQURED. 1106-2 TAPE RECORDER DATA AVAILABILITY MIGHT HAVE ASSISTED IN THE ANALYSIS OF AFT CAMERA FAILURE DURING REV 105 OF 1106-2.

5. DISIC CAMERA PERFORMANCE:

A. THE STELLAR CAMERAS FUNCTIONED PROPERLY THROUGHOUT THE MISSION AND RECORDED A FULL FIELD OF STARS ON BOTH THE PORT AND STARBOARD CAMERAS. MOST STARBOARD FRAMES HAVE MORE THAN 30 STAR IMAGES; MOST PORT FRAMES CONTAIN MORE THAN 100 STAR IMAGES. STARS ARE RECORDED AS POINT IMAGES.

B. THE TERRAIN CAMERA IMAGE QUALITY IS GOOD AND COMPARES FAVORABLY WITH MISSION 1103 AND 1104 TERRAIN IMAGERY.

C. DEPENDENT/INDEPENDENT MODE INDICATION HAS BEEN INCORPORATED IN THE DATA BLOCK OF THIS AND SUBSEQUENT DISIC UNITS. THIS ADDED FUNCTION OPERATED PROPERLY THROUGHOUT MISSION 1106.

D. 1144 TERRAIN FRAMES WERE REQUIRED TO COVER THE TOTAL PAN CAMERA OPERATION. 3408 TERRAIN FRAMES WERE USED IN INDEPENDENT PROGRAMMING.

E. AUTOMATIC STELLAR SOLAR SENSORS WERE NOT REQUIRED TO BE ACTIVATED DURING THIS MISSION.

6. DISIC ANOMALIES: NONE. NORMAL AND CHARACTERISTIC MARKINGS ARE LISTED FOR REFERENCE:

A. PRESSURE MARKS OUTSIDE FORMAT OF STELLAR RECORD. THESE MARKS ARE PRESENT IN THE BORDERS ALONG BOTH FILM EDGES OF THE ENTIRE STELLAR RECORD. THIS FOG PATTERN IS MORE DENSE THAN NORMAL AND IN MANY INSTANCES HAS SPUR THAT PROJECTS TOWARDS THE CENTER OF THE FILM NEAR THE TIME WORD. THIS HAD NO EFFECT ON AUTOMATIC TIME WORD READOUT.

CAUSE - SKEW BEADS. THIS IS A SYSTEM CHARACTERISTIC THAT IS NOT CONSIDERED OBJECTIONABLE AS LONG AS THE MARKS ARE CLEAR OF THE FORMATS AND DATA. SKEW BEAD MARKING IS SENSITIVE TO EXIT BOX ALIGNMENT ON TEST STANDS AND IN THE VEHICLE. MOST INSTRUMENTS HAVE BEEN ADJUSTED SO THAT THE PREDOMINANT MARKING IS AT THE FILM EDGE OPPOSITE THE TIME WORD.

ACTION - NONE REQUIRED.

B. MINUS DENSITY SPOTS WHICH APPEAR TO BE CAUSED BY DIRT ON THE RESEAU PLATE. DEGRADATION TO THE IMAGERY IS MINOR.

CAUSE- DIRT AND FILM/EMULSION PARTICLES CARRIED TO THE FOCAL PLANE PLATE BY THE FILM.

ACTION - CONTINUED ATTENTION TO CLEANLINESS PRIOR TO FLIGHT. PARTICLES CARRIED BY FILM CANNOT BE COMPLETELY ELIMINATED.

C. PLUS DENSITY PATTERNS ARE PRESENT BETWEEN MOST CAMERA FORMATS THROUGHOUT THE MISSION. NO DEGRADATION TO THE IMAGERY IS PRESENT.

CAUSE -INCOMPLETE COATING OF INCONEL ON THE EDGES OF THE FOCAL PLANE PLATE. THESE EDGES ARE LOCATED BETWEEN TERRAIN FORMATS DURING EXPOSURE WITH THE RESULT THAT IMAGE DEGRADATION WILL NOT OCCUR.

ACTION - NONE REQUIRED.

7. COMMENTS:

A. THIS IS THE FIRST CORONA SYSTEM IN WHICH COLOR MATERIAL WAS USED OPERATIONALLY TO SATISFY A SPECIFIC INTELLIGENCE REQUIREMENT; HOWEVER, DUE TO THE FILM SEPARATION ON PASS D105 THIS REQUIREMENT WAS NOT FULFILLED. THE 911 FEET OF SO-121 RECOVERED (SEE REMARKS) WAS EXPOSED ON REVS D103, D104, AND D105. ALTHOUGH THERE WERE SOME AREAS OF THE SO-121 FROM MISSION 1105 THAT WERE BETTER THAN THIS MISSION, THE OVERALL IMAGE QULAITY OF THIS FLIGHT WAS BETTER THAN THE 1105 COLOR. THE IMPROVED OVERALL IMAGE QUALITY OF MISSION 1106 IS CREDITED TO (1) INCREASED SYSTEM

TENSIONS PULLING THE FILM FLAT AND/OR (2) THE SHORT TIME PERIOD BETWEEN LAUNCH AND EXPOSURE LIMITING POTENTIAL DRYING-OUT OF THE COLOR FILM IN VACUUM. THE PET ESTIMATES THAT THE GROUND RESOLUTION IS 20 - 25 FEET. MINOR CORONA AND DENDRITIC STATIC MARKINGS WERE RECORDED. THESE MARKINGS ARE CHARACTERISTICALLY GREEN AND OCCASIONALLY RECORDED AS RED WHEN EXPOSURE IS MADE THROUGH THE BASE OF THE MATERIAL. THE COLOR BALANCE AND EXPOSURE ARE CONSIDERED TO BE GOOD EXCEPT FOR PHOTOGRAPHY OVER SNOW COVERED TERRAIN AT HIGHER SOLAR ELEVATIONS. THE PHOTOGRAPHY IN THIS REGION IS CONSIDERED BY BOTH THE PROTOINTERPRETERS AND THE PET TO HAVE BEEN OVEREXPOSED.

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B. THE END OF THE AFT RECORD CONSISTED OF 2000 FEET OF SO121 COLOR FILM WITH A MYLAR SPLICE LOCATED AT 950 FEET. COLOR ACQUISITION BEGAN ON PASS D103 FRAME 171. PASS D105 FRAME 129 WAS THE LAST FRAME RECOVERED, RESULTING IN A TOTAL RECOVERED COLOR PAYLOAD OF 911 FEET, (347 FRAMES). IN FLIGHT TM DATA INDICATED THAT ON PASS D105 FRAME 137 THE SUPPLY SPOOL WAS FREE RUNNING IN A DIRECTION OPPOSITE TO NORMAL ROTATION. A FREE RUNNING SUPPLY SPOOL INDICATES A SPEPARATION OF THE FILM WEB. BECAUSE OF THE CLOSE PROXIMITY OF THE FILM SEPARATION AND THE SPLICE, THE POSSIBILITY OF THE MYLAR SPLICE CONTRIBUTING TO THIS ANOMALY CANNOT BE OVERLOOKED. THE IN FLIGHT TM FILM DEPLETION SIGNATURE PRODUCED ON INSTRUMENT NO 2 IS IDENTICAL TO THE SIGNATURE PRODUCED BY THE END OF THE COLOR MATERIAL ON INSTRUMENT NO 1 INDICATING THAT THE LAST FEW FEET OF MATERIAL ON BOTH INSTRUMENTS REMAINED IN ORBIT. THIS CHARACTERISTIC FILM DEPLETION SIGNATURE HAS BEEN OBSERVED ON CR-4 AND CR-5. PAST EXPERIENCE WITH CORONA SYSTEM TESTING HAS INDICATED THAT MYLAR SPLICES EXHIBIT ADHESIVE BLEEDING CAUSING SUCCESSIVE FILM WRAPS TO STICK TOGETHER RESULTING IN A SHOCK LOADING AND RESULTING TENSION TRANSIT IN THE SYSTEM. TO ELIMINATE THIS STICKY SPLICE PROBLEM, ALL SINGLE EMULSION TYPE FLIGHT LOADS ARE SPLICED WITH PERMACEL TAPE INSTEAD OF MYLAR. THE PRESENT CR SYSTEM MATERIAL CHANGE DETECTOR WILL NOT OPERATE PROPERLY WITH THE PERMACEL TAPE SPLICES, SO ALL MIXED EMULSION FLIGHT LOADS REQUIRE MYLAR SPLICES. INVESTIGATION OF IMPROVED SPLICES INCLUDING PERMACEL AND ULTRASONIC TYPES ARE UNDER INVESTIGATION BY [redacted]

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C. THERMAL ENVIRONMENT - THE SLIGHTLY RESTRICTED LAUNCH WINDOW, MODIFIED PAINT PATTERN, AND INCREASED LENS INSULATION WERE UTILIZED ON THIS MISSION. THE RUSULTING THERMAL ENVIRONMENT WAS THE BEST EVER OBTAINED. THE FWD-LOOKING INSTRUMENT HAD AN AVERAGE INSTRUMENT TEMPERATURE OF 63 PLUS OR MINUS 3 DEGREE F THROUGHOUT BOTH MISSIONS. THE THERMAL GRADIENT ON THE LENS CELL WAS APPROXIMATELY 4 DEGREE F AND TRANSIENTS WERE PLUS OR MINUSE 1 DEGREE F. THE AFT-LOOKING INSTRUMENT HAD AN AVERAGE INSTRUMENT TEMPERATURE OF 64 PLUS OR MINUS 5 DEGREE F THROUGHOUT BOTH MISSIONS. THE THERMAL GRADIENT ON THE LENS CELL WAS APPROXIMATELY 2 DEGREE F AND TRANSIENTS WERE PLUS OR MINUS 1 DEGREE.

THIS MISSION USED A 23A FILTER (VICE W/25) AS THE PRIMARY ON THE FORWARD CAMERA. THE PET CONSIDERS THE FORWARD PHOTOGRAPHY WAS IMPROVED BY THE SHORTER EXPOSURE TIMES AND THE SLIGHT INCREASE IN SPECTRAL WAVE LENGTH BAND. THE PET BELIEVES THE FORWARD CAMERA SHOULD USE THE 23A FILTER ON FUTURE MISSIONS TO REDUCE SMEAR THROUGH SHORTER EXPOSURE TIME.

THE PET RECOMMENDS FOR FUTURE CONSIDERATION, THE UTILIZATION OF A W/21 FILTER IN THE ALTERNATE POSITION OF THE FORWARD LOOKING CAMERA. IN ADDITION, CURRENT WORK IN THE FIELD INDICATES THE POSSIBILITY THAT A LONGER WAVE LENGTH FILTER IN THE AFT LOOKING CAMERA MAY BE ADVANTAGEOUS.

T O P S E C R E T

--END OF MESSAGE--